

The 1<sup>st</sup> Global Research Platform Workshop@San Diego



# Korea Research Platform

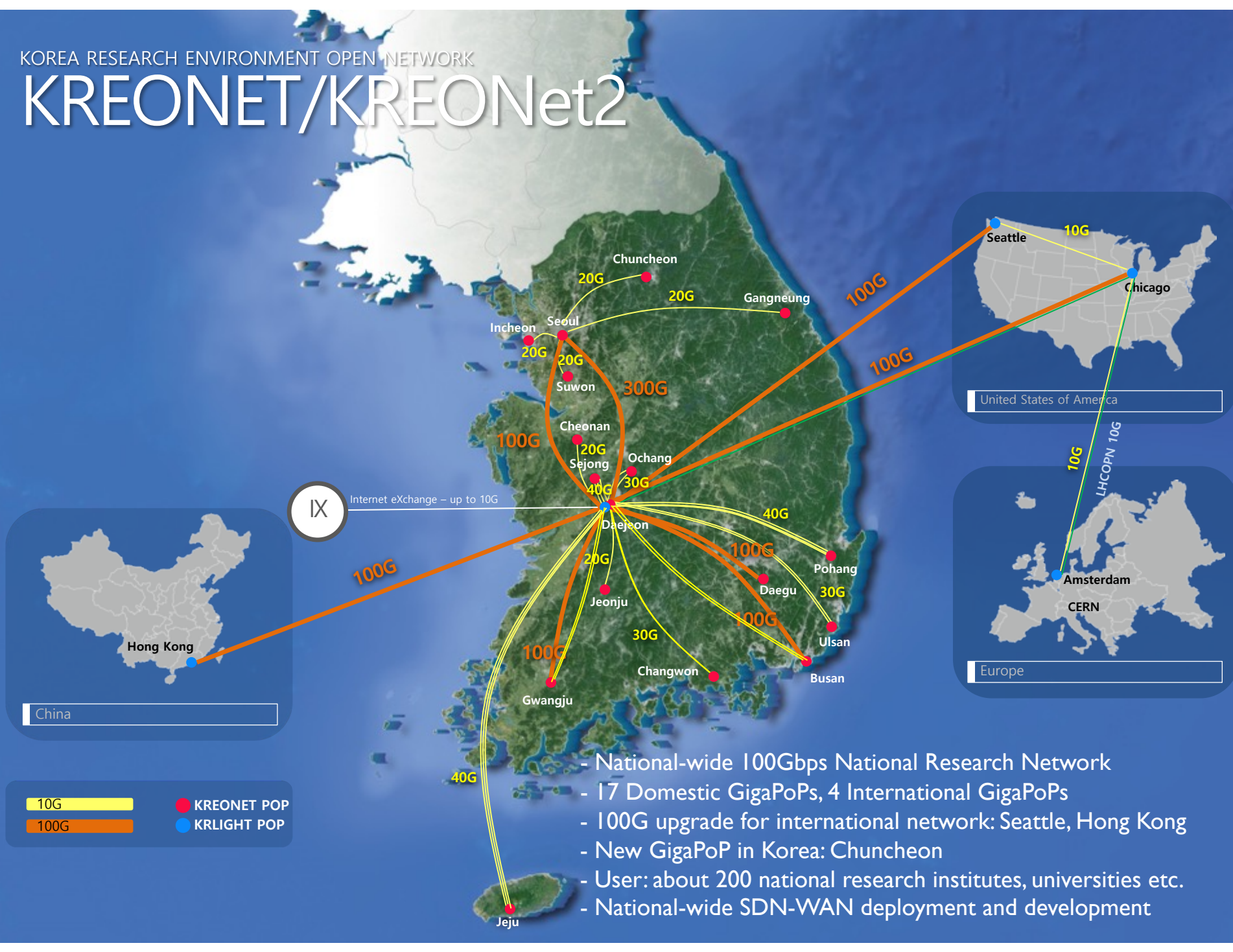


September 19, 2019  
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**KREONET Center,  
National Institute of  
Supercomputing & Networking, KISTI**

KOREA RESEARCH ENVIRONMENT OPEN NETWORK

# KREONET/KREONet2



IX Internet eXchange – up to 10G

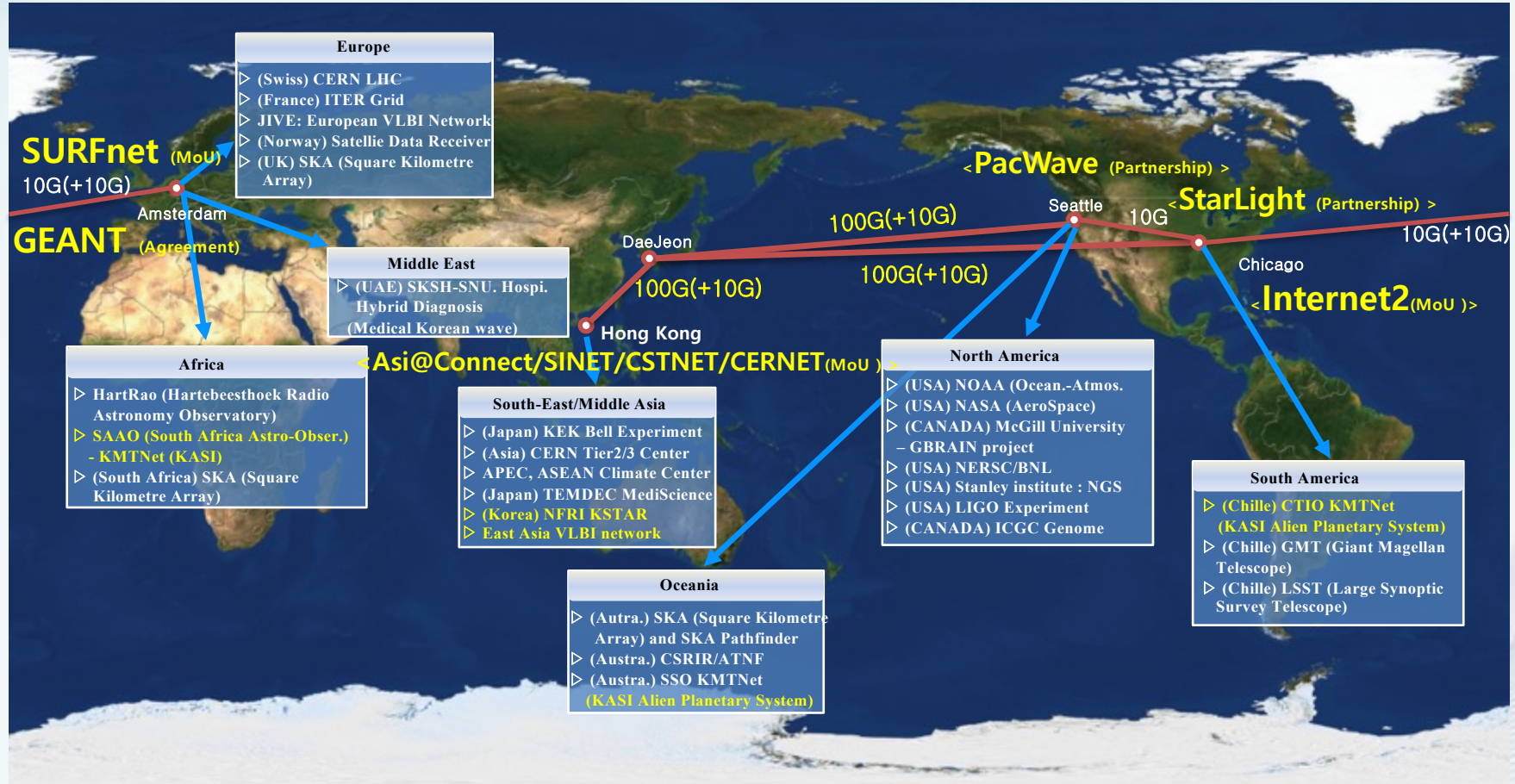
United States of America

Europe

China

10G  
100G  
KREONET POP  
KRLIGHT POP

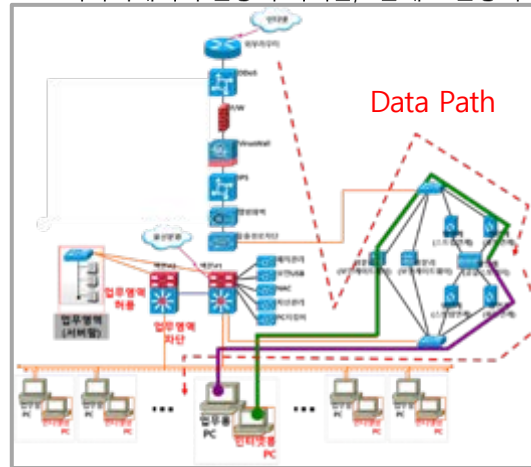
- National-wide 100Gbps National Research Network
- 17 Domestic GigaPoPs, 4 International GigaPoPs
- 100G upgrade for international network: Seattle, Hong Kong
- New GigaPoP in Korea: Chuncheon
- User: about 200 national research institutes, universities etc.
- National-wide SDN-WAN deployment and development



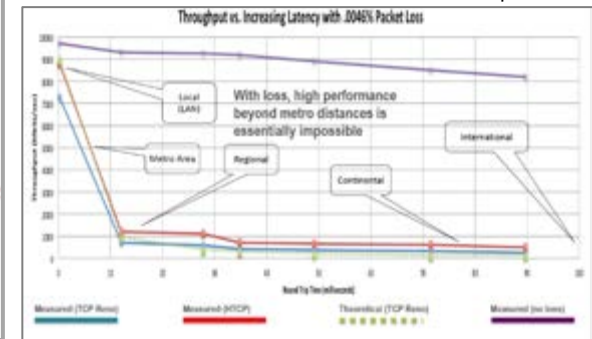


Data path is a very complicated  
(7 steps to enter the inside)

Big data super-highway



Packet loss problems

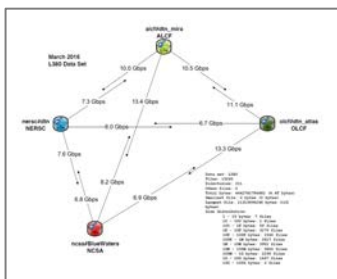


0.0046% packet loss make a huge performance down

## ScienceDMZ Examples



**US/CENIC**  
PRP Project, connecting Science Big Data sources with ScienceDMZ (Calit2)



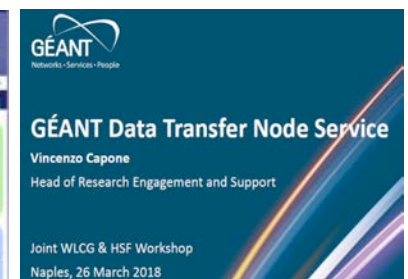
**US/ESNET**  
ESNet connecting Supercomputers with ScienceDMZ (ESNet)



**US/Fermilab**  
DTN as a Service for BigData Express(iCAIR)



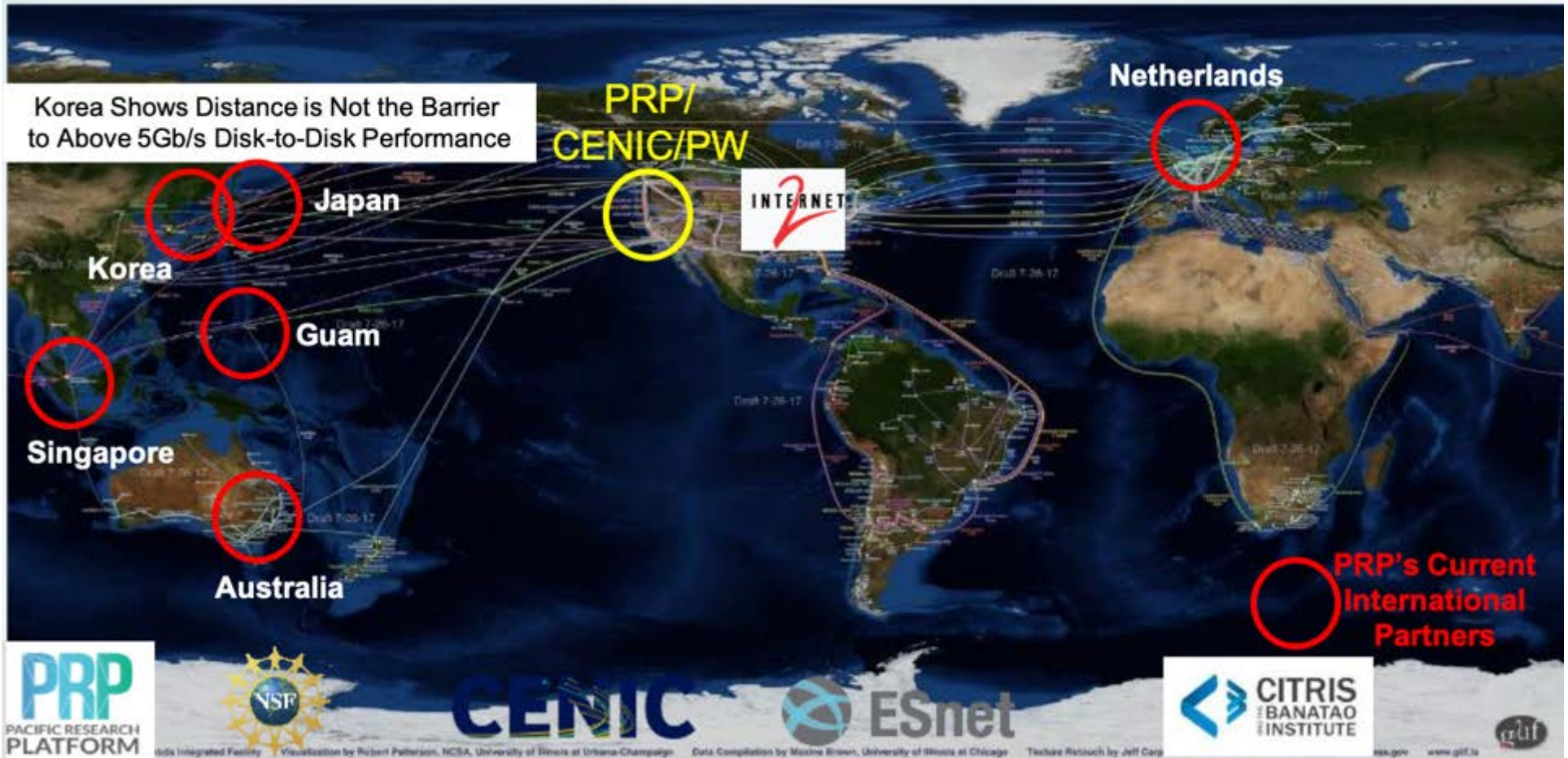
**US/NCAR**  
ESNet trying to integrate ScienceDMZ to NCAR RDA (ESNet)



**Europe/GEANT**  
EU trying to Implement ScienceDMZ on GEANT (GEANT)



Via CENIC/Pacific Wave, Internet2, and International Links



Source. Larry Smarr/Calit2

## • KISTI's ScienceDMZ Deployment

- Last-mile connection of DTNs with SDN/L3 connection in KISTI/KREONET
  - **100G** : International & Giant Group Research & Study
  - **10~40G** : Domestic Scientific Research Group / **~1G** : Normal User (Fionette)
- **GPU and Alveo U200 (FPGA)** based DTN for PRP and Domestic
- Participated in 1st PRP Workshop since 2015 & 1<sup>st</sup> NRP Workshop since 2017



**K\*GENOME**

## • ScienceDMZ Deployment in Korea

- Domestic activity
  - Focus on **Data-Intensive Science Research Group in KREONET**
  - Examples : K\*GENOME, GENOME RDC, LSST, HEP(CMS, ALICE), SDO, HPC, GSDC, KSTAR, KBSI TEM, eKVN etc.
  - Especially, 100Gbps lastmile connection provided to KASI: eKVN(Korea VLBI network) and LSST and NFRI: KSTAR/ITER
  - **KISTI's 5<sup>th</sup> Generation New Supercomputer (25.7Pflops) with DTN Cluster**
- International
  - Participate in PRP, NRP, APRP
  - Asian PRP : ScienceDMZ deployment with APAN members
  - Collaboration with '**Peta Scale DTN Project**'



**Genome RDC**



**LSST**



**eKVN**



**HEP (CMS, ALICE)**



**KBSI TEM**



**KSTAR**



**GSDC**



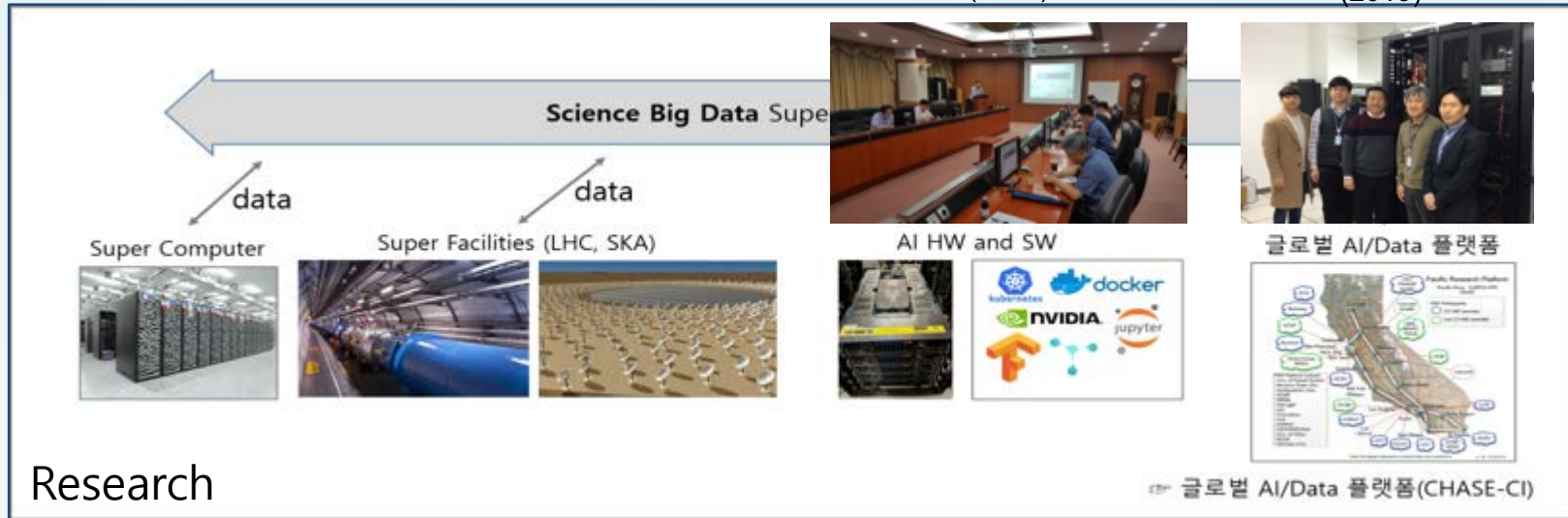
**Supercomputer(5<sup>th</sup>)**



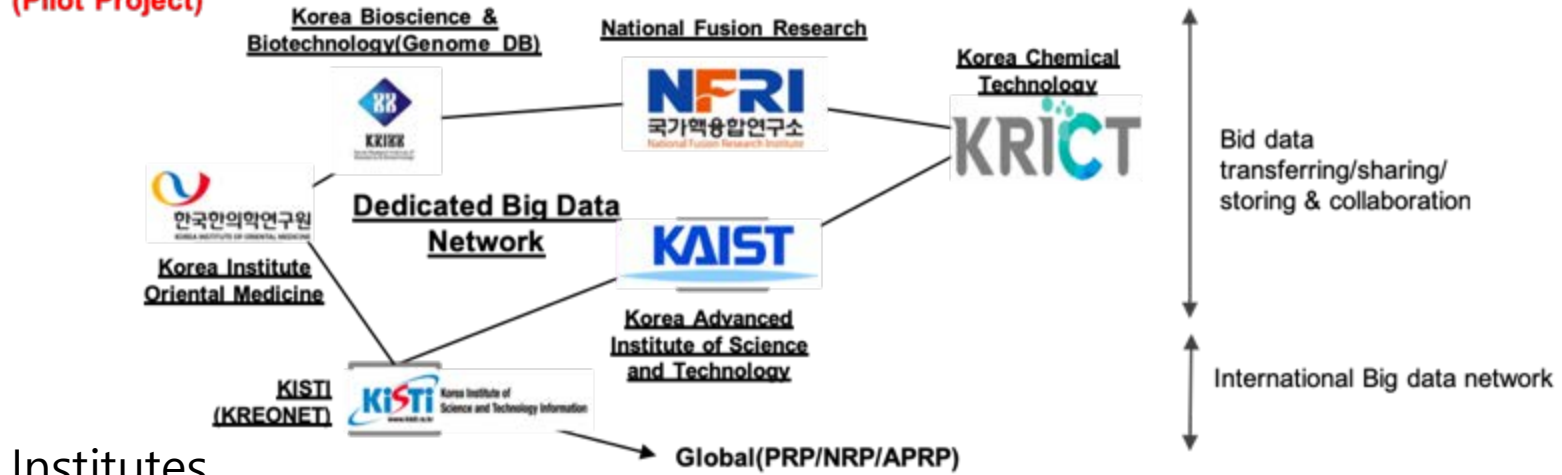
**SDO**

Building the community of R&E together project (2018)

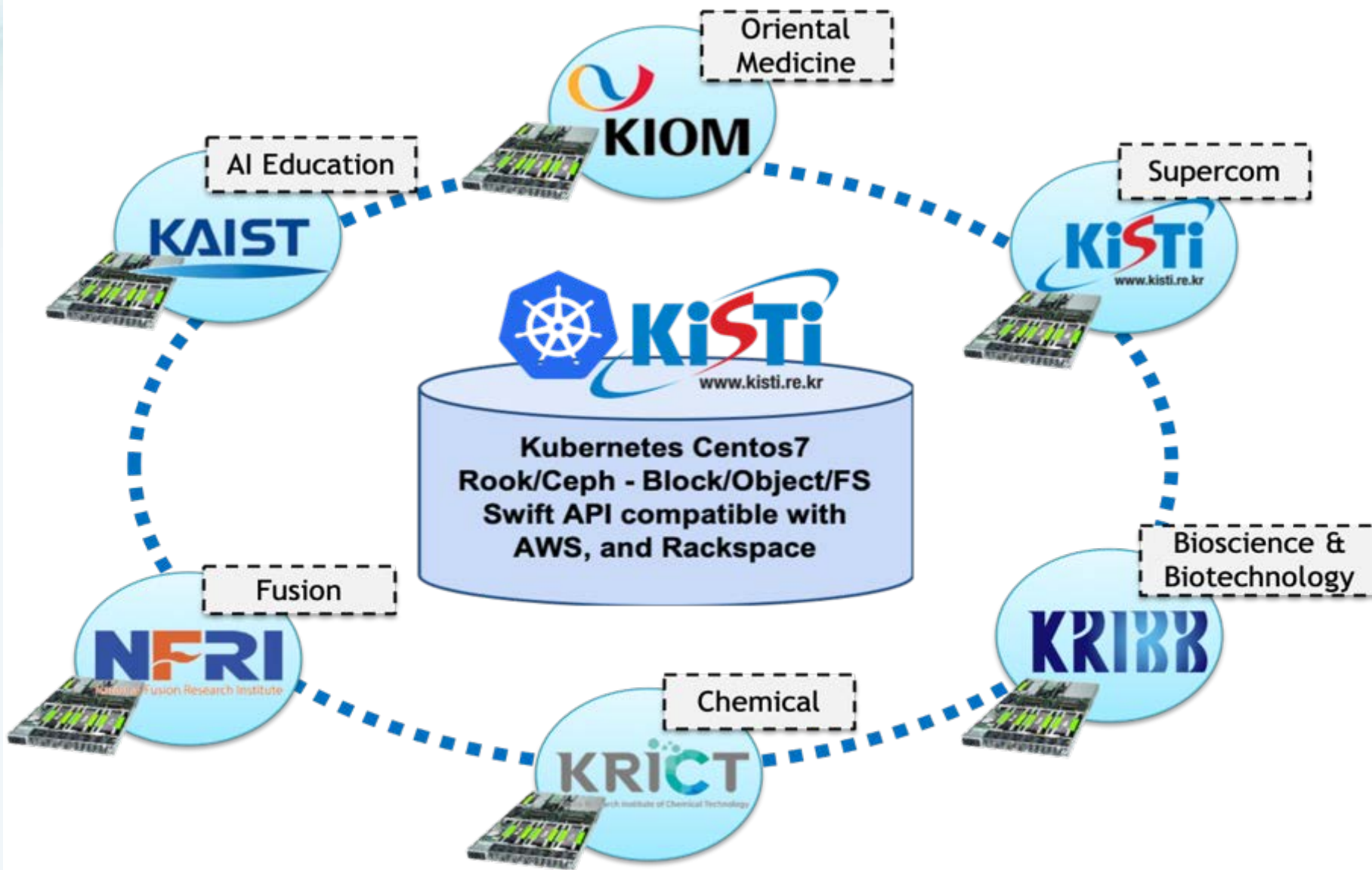
Deployment of Science DMZ and perfSONAR/DTN (2019)



## KREONET R&E Together (Pilot Project)





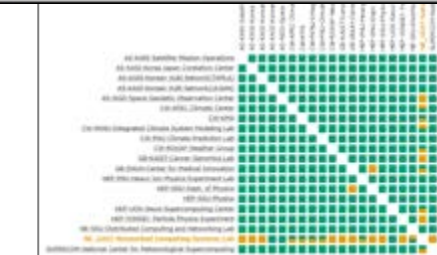
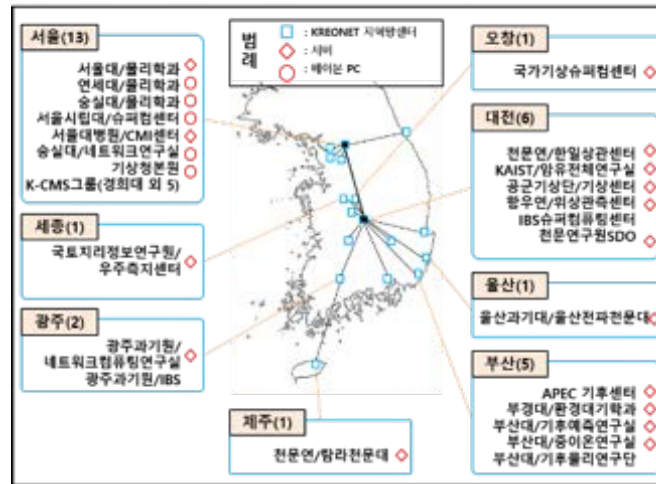


**30 Science DMZ Sites are ready to service (expanding to 50 Sites until 2020)**

- HEP, Climate Change & Weather forecasting, Astronomy, Fusion Energy, Genomics, Supercomputing, etc
- Maintain Green Level Throughput Performance by monitoring PerfSONAR MaDDash
- Seoul(13), Daejeon(6), Busan(5), Gwangju(2), Ochang(1), Jeju(1), Sejong(1), Ulsan(1)

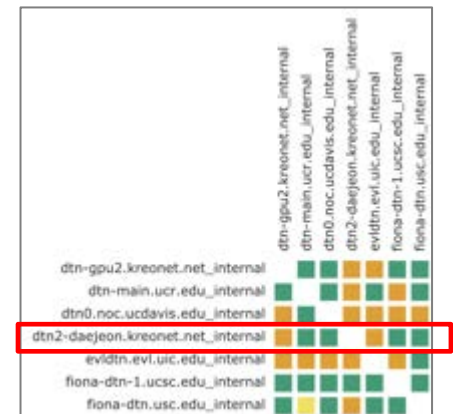
대상 기관	네트워크 속도	목표성능보장	지역
서울대 / 물리학과	10G	90%이상	서울
연세대 / 물리학과	10G	90%이상	서울
충실대 / 물리학과	1G	90%이상	서울
부경대	1G	90%이상	부산
국가기상슈퍼컴센터	10G	90%이상	오창
광주과학기술원	10G	90%이상	광주
경북대	1G	90%이상	대구
우주측지센터	1G	90%이상	세종
포항공대	1G	90%이상	포항
천문연 탐라천문대	10G	90%이상	제주
천문연 상관센터	10G	90%이상	대전
부산대	1G	90%이상	부산
APCC	1G	90%이상	부산
핵융합연구소	10G	90%이상	대전
서울대병원 CMI	10G	90%이상	서울
KAIST / 양유전체연구실	10G	90%이상	대전
천문연 연세천문대	10G	90%이상	서울
천문연 울산천문대	10G	90%이상	울산
공군기상단	1G	90%이상	대전
기상청본원	1G	90%이상	서울
IBS 슈퍼컴퓨팅센터	10G	90%이상	대전
부산대/기후물리연구단	1G	90%이상	부산
광주과학기술원/IBS	1G	90%이상	광주
천문연구원SDO	10G	90%이상	대전
K-CMS그룹 (경희대 외 5기관)	1G-10G	90%이상	서울

## 30 ScienceDMZ Sites in Korea



20 sites performance monitoring (Maddash)

## Interantional Connection



International Connection for PRP(MaDDash)

## Institute/University /project

- KASI, Ulsan Univ., Yeonsei Univ., KIAS, Chungbuk Univ.
- SDO, SDSS, KVN, KMTNET

## Network Resource /Technology

- Between Radio Telescope : 10/40/100G
- Data Center(Daejeon): 100G
- SDO Data Center: 10G
- KMTNET 10G

## Acitivities

- eKVN Data Transfer (3 Radio Telescope, Yeonsei Univ. Tamra Univ. Ulsan Univ.)
- Collaboration with global radio telescope in Chile, Australia, EU, and US
- SKA Pathfinder Project



## Institute/University

- SNU, Korea Univ., Sejong Univ., GSDC/KISTI, KNU, UOS, Busan Univ., Youngkwang Nuclear Generating Station, Hanyang Univ., Soongsil Univ.
- CMS, ALICE

## Network Resource /Technology

- LHCOPN (10G/GSDC-CERN)
- LHCONe (VRF)
- Youngkwang Nuclear Generating Station Detector (10G)
- GRID Computing (KNU/10G)

## Activities

- WLCG Data Transfer among Tier 0-Tier1-Tier2-Tier3
- KEK Belle Collaboration
- CMS & ALICE Collaboration
- BNL STAR Project (Busan Univ.)



## Institute/University

- KMA, KMA Supercomputing Center(Ochang), Busan Univ., PKNU, KBS Disaster Broadcasting Center, KAERI, APEC Climate Center

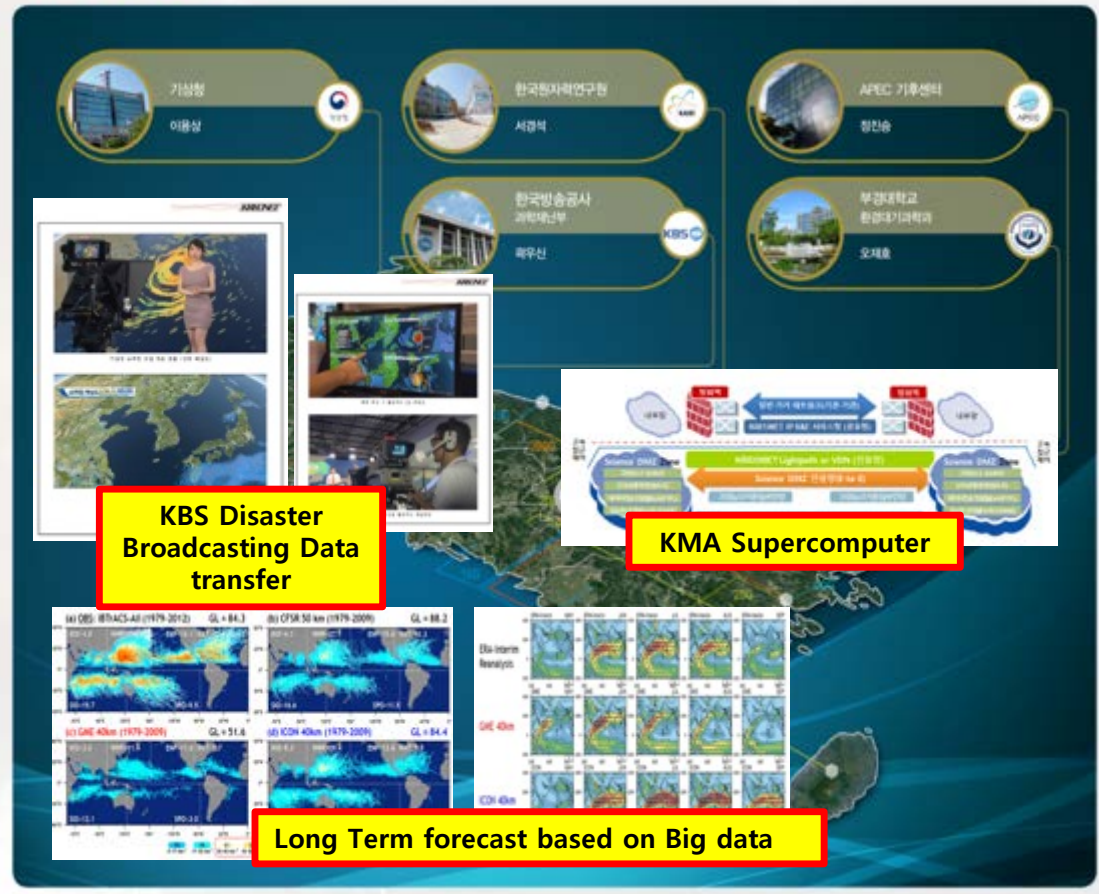
## Network Resource /Technology

- KMA Supercomputing Center (10G)
- APCC, Busan Univ., PKNU
- KMA(HQ)-Weather Group of R.O.K Air Force(1G)
- KBS Disaster Broadcasting(1G)

## Activities

- Collection global climate data and weather forecasting
- Development of new weather forecast model

## 기상/기후 첨단연구기관



## Institute/University

- SNU Hospital, Kangbuk SNU Hospital, Iwa Univ. Hospital, Seoul Health College, SNU, SNU-CMI, NCC, KOBIC, CODA, Hanyang Univ, UNIST, Soongsil Univ.

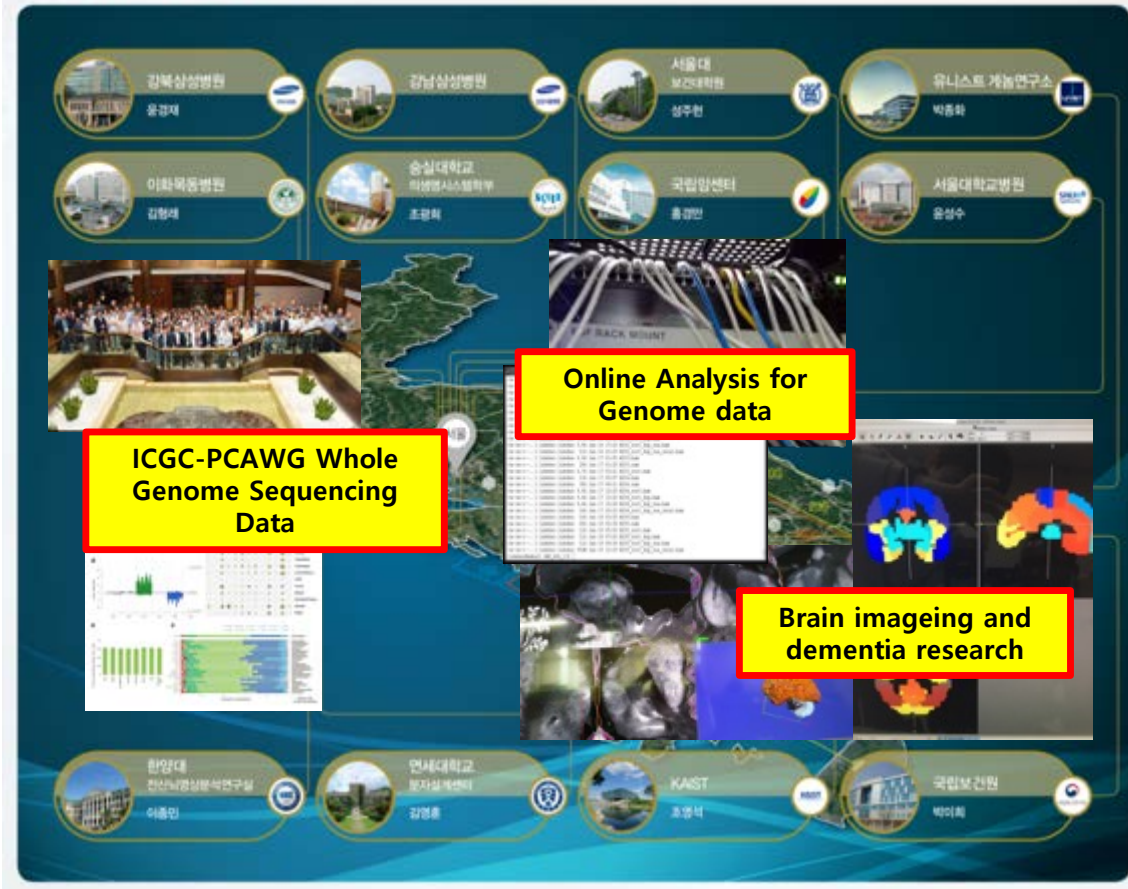
## Network Resource /Technology

- SNU CMI (10G)
- QKD network (CODA-KOBIC)
- ICGC-PCWAG Data Storage and Distribution

## Activities

- nGenome data transfer
- Patients Privacy Protect and sharing environment
- TB Genome data transfer to RDC

## 게놈/바이오 첨단연구기관



## Institute/University

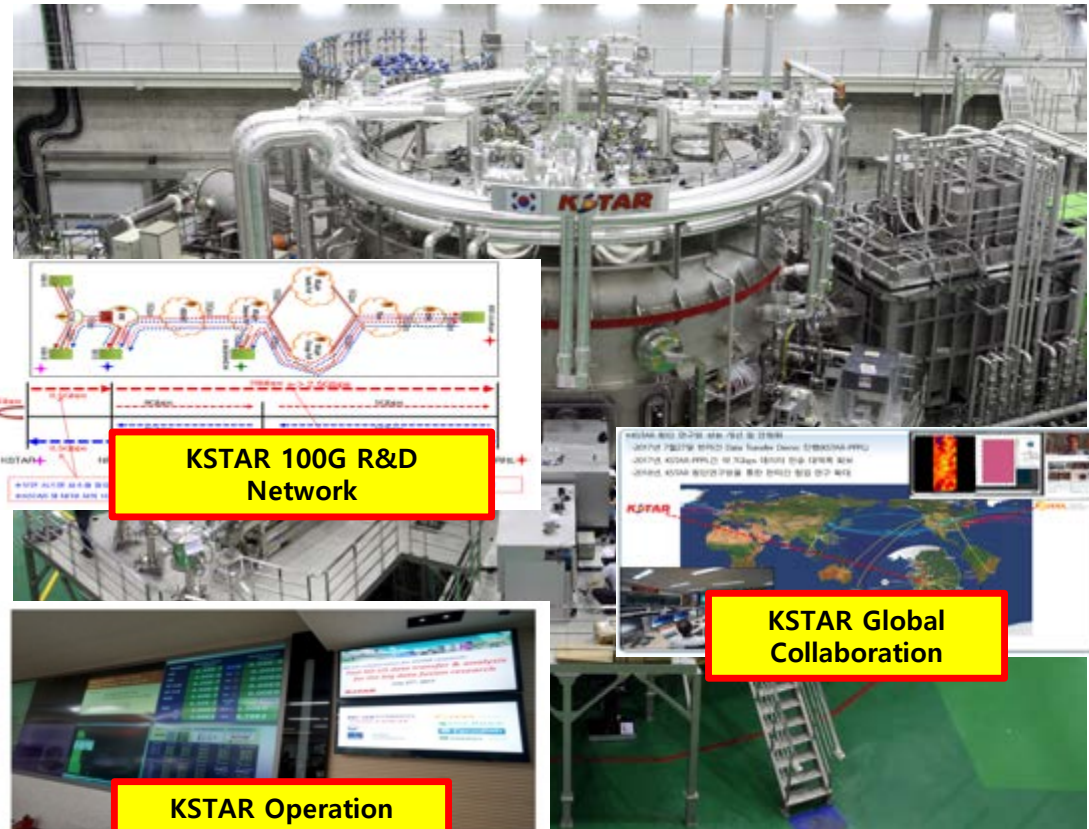
**KSTAR/ITER, NFRI(Nation Fusion Research Institute)**

## Network Resource /Technology

**KSTAR (100G)  
100G perfSONAR/DTN  
ECE/ADDIOS  
Bigdata Express**

## Activities

- Big data transfer from KSTAR to NERSC/ORNL/PPPL/General Atomics, US
- Real time remote data analysis



## Institute/University

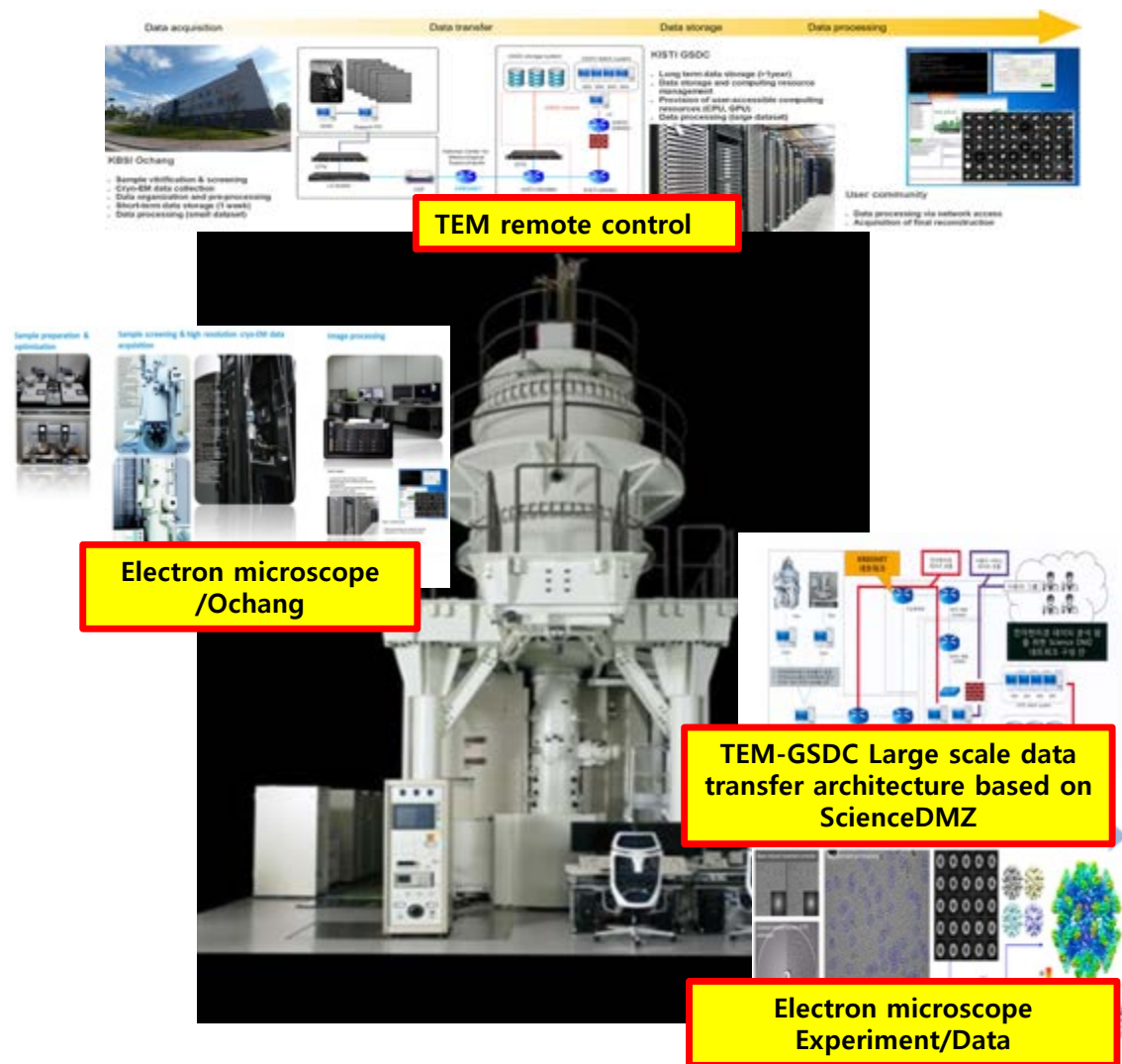
- Bio-HVEM/TEM (Transmission Electron Microscope), KBSI
- GSDC(Global Science Data Hub Center), KISTI

## Network Resource /Technology

- Bio-HVEM/TEM, KBSI (10G)
- GSDC, KISTI (10G)
- Science DMZ
- Data Storing

## Activities

- Remote access and remote observation
- Experiment/Observation data transfer





A photograph of a large, modern building at night, illuminated with blue and white lights. The building has a distinctive curved facade and multiple stories of windows. The text "Thank you" is overlaid in the center of the image in a large, white, sans-serif font. The background shows a dark blue sky with some clouds and other buildings in the distance. In the foreground, there is a parking lot with several cars and some trees.

**Thank you**